

In the grasslands between Wakro and Chowkham, covering parts of Turung, and northwestern areas of Kamlang RF and adjacent grasslands on the banks of the Lohit and Kamlang rivers, some 60 to 90 buffaloes occur. Between Chowkham and Sunpura, covering parts of Lohit, Paya and Digaru RFs including the adjacent unclassified forests, a widely scattered population of 20 to 40 animals occurs. Westwards, it is contiguous with some of the buffalo-bearing areas of Bhim *chapori* of Sadiya in Tinsukia dist. (Assam). The total habitat available for wild buffalo in the district is around 150 sq. km. (Fig. 1).

Expansion of lowland paddy cultivation by the Khamtee tribe in the southern areas of the Lohit river, poaching for meat by the Khamtees, Digaru Mishmi and Miju Mishmi tribals, development of townships at Tezu, Chowkham and Wakro and shifting of many interior villages to the fertile plains have resulted in a gradual decline of the wild buffalo. Moreover, the

presence of domestic buffaloes in the *khutis* is a potential hazard to the small wild population due to the danger of diseases like anthrax, foot-and-mouth and rinderpest. However, domestic males are usually not kept in the *khutis* and hence, contamination of wild stock due to interbreeding is a remote possibility. Domestic animals going feral are also brought back immediately, because they are too valuable to their owner. The feral animals are also shot by the local tribals for food.

Poaching with guns and rifles is taking its toll, and unless conservation measures are taken, the future of these animals in Lohit dist. is bleak. The grassy parts of Kamlang RF, Lai Anchal RF and some adjacent areas (totalling about 30 sq. km) have been recommended as additions to the Kamlang Wildlife Sanctuary.

Oct. 27, 1998 ANWARUDDIN CHOUDHURY
The Rhino Foundation for Nature in NE India
 C/o The Assam Co. Ltd.
 Bamunimaidan - Guwahati - 781 021. Assam.

REFERENCES

- CHOUDHURY, A.U. (1994): The decline of the wild water buffalo in north-east India. *Oryx*. 28(1): 70-73.
- CHOUDHURY, A.U. (1996): Trekking through Kamlang. *Sanctuary Asia XVI*(5): 44-49.
- CHOUDHURY, A.U. (1998): Wild water buffalo *Bubalus bubalis arnee* in Dibang Valley district of Arunachal Pradesh. *J. Bombay nat. Hist. Soc.* 95(1): 110-112.
- COOPER, T.T. (1873): The Mishmee Hills. Mittal Publications, New Delhi (reprint 1995).
- KATTI, M. S. MUKHERJEE, N. MANJREKAR & D. SHARMA (1990): A report on a wildlife survey in Arunachal Pradesh with special reference to takin. Wildlife Institute of India, Dehra Dun. pp 103.

3. DAYTIME RESTING IN THE NEST — AN ADAPTATION BY THE INDIAN GIANT SQUIRREL *RATUFA INDICA* TO AVOID PREDATION

Predation may play an important role in influencing social behaviour. In tree squirrels, predation could affect nest tree selection and behavioural strategies. Most studies on temperate and tropical squirrels have documented the importance of diurnal raptors as predators of sciurids. (Emmons 1980, Borges 1989, Joshua 1992).

Predation attempts by the black eagle (*Ictinaetus malayensis perniger*) and crested

serpent eagle (*Spilornis cheela*) on the Indian giant squirrel (*Ratufa indica*) and grizzled giant squirrel (*R. macroura*) have been reported by Borges (1989), Ramachandran (1991), Joshua (1992), and Joshua and Johnsingh (1994). I observed three unsuccessful predation attempts by the crested hawk-eagle (*Spizaetus cirrhatus limnaetus*) on the Indian giant squirrel (*Ratufa indica*) in Bori Wildlife Sanctuary (WLS), Madhya Pradesh (Datta 1993).

Squirrels were observed in two riverine patches surrounded by deciduous forests. One of these, along Bhainsa *nullah* was subject to disturbance due to nearby villages and cattle grazing. Canopy gaps exist in this forest due to felling of trees in the past. The other study site was a relatively undisturbed riparian habitat.

Observations were made while following five individually identified squirrels twice a month from dawn to dusk, using focal animal sampling (Altmann 1974) from December 1992 to April 1993. Two other individuals were also observed for 2 days each in December.

After the morning feeding bout, giant squirrels usually return to their nest tree to rest. The nest seems to be the focal point to which they return after foraging. Squirrels rested inside the nest in the afternoons, both in summer and winter. They rarely rested for long periods in the canopy. A large part of the day was spent inactively inside the nest. Previously, nests were reported to be used extensively in the daytime only in the wet season and also at mid-day during the dry season (Borges 1989). I found that the squirrels usually returned to the nest or adjacent trees after foraging in the morning. A squirrel which is resting for long periods in the afternoon outside the nest can be extremely vulnerable to avian predators which were seen frequently in the relatively shady, cool riparian area. These raptors were active in the afternoon, calling and flying through the canopy, and perching on the tall *Terminalia arjuna* trees. A squirrel resting outside would have to be alert because of greater chances of predation, whereas inside the nest it would be safer. Resting inside the nest in the daytime could thus be an adaptive strategy to avoid predation. In fact, a predation attempt was seen when an individual squirrel came out of the nest in the afternoon, to rest outside. The individual I was following was safe inside the nest and could not be detected by raptors. The two raptor species sighted here are not reported to be nest robbers, unlike the black eagle (Joshua and Johnsingh 1994).

Based on my observations and anecdotal evidence, I hypothesize that giant squirrels, irrespective of sex or even season rested inside the nest as an anti-predatory strategy. It is not unusual for temperate squirrels to rest inside the nest in the winter months because of the harsh sub-zero temperatures. But tropical squirrels have not been reported to enter the nest in the daytime except during heavy rains or inclement weather (Borges 1989, Joshua 1992). Borges (1989) reported that they used the nest for resting at mid-day in the dry season, attributing it to facilitation of heat loss in summer. But this was not a regular occurrence in her study area. They usually rested on horizontal broad branches in the canopy after their morning forage and rarely entered the nest except to feed young or in very bad weather (Borges 1989). In any case, if the squirrels were resting inside the nest due to weather conditions, they would not be doing so both in summer and winter (December 1992 to April 1993). Therefore, it is unlikely that it is thermoregulatory behaviour. This behaviour was observed for all focal squirrels. This could be a local adaptation to a disturbed habitat, where the canopy is more open and where there seems to be a high density of two raptor species which prey on giant squirrels. Emmons (1980) speculated that by retiring to the nest early, a squirrel could minimise its daily exposure to diurnal avian predators.

Nevertheless, towards the end of my study in April, on the last two days, the individuals I followed did not retire to the nest but rested in the lower canopy which was still leafy and shaded. Since it was summer, the nests were exposed to the sun in the top canopy of the nest trees at the edge of the riparian area. Therefore, at certain times, unfavourable nest temperature may prevent the squirrels from resting in the nest.

Raptors were sighted at least once on every observation day, frequently between 1000 h and 1430 h, though in winter they were twice recorded around 0640 h. A nest of the crested-hawk eagle was sighted further up the *nullah* on

in secondary forests, verges, clearings, scattered woodlands and plantations. They are not birds of the primary forest interior (Thiollay and Meyburg 1988). They perch in tall trees using them as lookouts to scan for prey, reportedly jungle fowl, peafowl, partridges, hares, rodents, snakes and lizards. I observed a hawk-eagle preying on a field or bush rat in the late afternoon. On another occasion, I observed for close to an hour a hawk-eagle feeding on an unidentified prey.

Predation rates have been reported higher close to the forest edge, suggesting that predation rate was high due to predators living in the surrounding habitat and penetrating the forest fragments (Wilcove 1985, Wilcove *et al.* 1986). The relative abundance of raptorial species was found to increase in disturbed and logged forests (Johns 1983).

The general behaviour pattern observed in all focal squirrels, and incidentally in other non-focal squirrels entering the nest in the daytime to rest for long periods, may constitute a local adaptation to a more disturbed, open canopy habitat, where avian predator density, activity and predation attempts seem high.

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October 24, 1998 APARAJITA DATTA
*Wildlife Institute of India, Post bag 18,
Dehradun 248 001.*

REFERENCES

- ALTMANN, J. (1974): Observational study of behaviour: sampling methods. *Behaviour* 49: 227-266.
- BORGES, R.M. (1989): Resource heterogeneity and the foraging ecology of the Malabar Giant Squirrel (*Ratufa indica*). Ph.D. dissertation, University of Miami, Florida.
- DATTA, A. (1993): Space-use patterns of the Indian giant squirrel (*Ratufa indica centralis*) in relation to food availability in Bori Wildlife Sanctuary, Madhya Pradesh, India. Unpubl. M.Sc. thesis, Saurashtra University, Rajkot, Gujarat.
- EMMONS, L.H. (1980): Ecology and resource partitioning among nine species of African rain forest squirrels. *Ecological Monogr.* 50(1): 31-54.
- JOHNS, A.D. (1983): Ecological effects of selective timber extraction. Unpublished Ph.D. thesis. University of Cambridge.
- JOSHUA, J. (1992): Ecology of the endangered grizzled giant squirrel (*Ratufa macroura*) in Tamil Nadu, South India. Ph.D. dissertation, Bharatidasan University, Tiruchirapalli, Tamil Nadu.
- JOSHUA, J. & A.J.T. JOHNSINGH (1994): Impact of biotic disturbances on the habitat and population of the endangered grizzled giant squirrel (*Ratufa macroura*) in south India. *Biol. Cons.* 68(1): 29-34.
- RAMACHANDRAN, K.K. (1991): Ecology and Behaviour of Malabar Giant Squirrel (*Ratufa indica maxima*) Schreber. K.F.R.I. Research Report: 55 (Summary).
- THIOLLAY, J. & B.U. MEYBURG (1988): Forest fragmentation and the conservation of raptors: A survey on the island of Java. *Biol. Cons.* 44: 229-250.
- WILCOVE, D.S. (1985): Nest predation in forest tracts and the decline of migratory songbirds. *Ecology* 66: 1211-1214.
- WILCOVE, D.S., C.H. McLELLAN & A.P. DOBSON (1986): Habitat fragmentation in the temperate zone. In M.E. Soule, (ed.) Conservation biology: The science of scarcity and diversity. Sinauer Assoc. Sunderland, Mass. pp 237-256.

4. REDISCOVERY OF THE AFGHAN MOLE VOLE *ELLOBIUS FUSCOCAPILLUS* IN PAKISTAN

(With one plate)

Rodents which spend most of their lives underground are hard to catch or trap, and hence are poorly represented in the world's major museum reference collections.